

Some Remarks on the
GREEK THEORY
OF
Tuning Instruments ;
& some observations on the Harmonic
Sounds of the
VIOLONCELLO ,
Illustrative of that Speculation
according to the principles of the late
D^r. Cooke & D^r. Pepusch ,
by
H. COOKE .

INTRODUCTIO HARMONICA.

The Greek Theory of Music
explains a Natural Phenomenon.

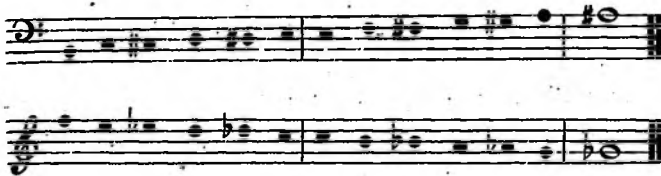
Sound Generates

And the following account or paraphrase of this Theory, or contemplation, or speculation is dedicated respectfully to all true lovers of Song and Harmony by

THE AUTHOR.

INTRODUCTIO. HARMONICA.

Musicae alia est pars Theoretica alia practica.



Although in a tempered scale, these Sharps and Flats ascending and descending, are the same or enharmonic.. Yet according to the Greek Theory, or mental scheme, they are different sounds. — which is correct: — for by any of the 'Tunings per diastim. or by skips i.e. from place to place. they will become different sounds. perfect fifth tuning Hyper and Hypo. or sub and super. enlarges the octaves or generates. hence Genus and Genera. (a)

This Generation of sound accounts for the necessity of the temper. Antient and Modern for such instruments as Harps, Lyres, Organs, Harpsichords, and Piano-fortes: Flutes, Horns, Trumpets, Violins, Violoncellos &c. &c. are still Barbs or untempered. (b).

The Greeks had a singing scale perfectly distinct.. consisting of four tones Proton, Deuteron,

Triton, Tetarton, repeated like our Gamut perhaps—but a Harp or Piano-forte cannot be tuned by the Gamut.

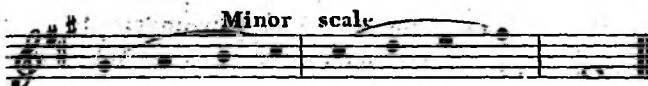
The Greek Tetracords consist per systema or singing scales of perfect Fifth Tunings (or perfect Fourth Tunings which is the same thing) Hypo and Hyper per diastim i.e. above and below by skips.

The Greek diatonic and chromatic tetracords have been pretty generally understood: but the enharmonic tetracord has been most grossly misrepresented.—it contains merely the Greek temperament or Spiss sounds. Sounds which may be thickened or mixed together for the temper or mistum. this may be seen in Euclid or Keeble; three or four observations more.

1stly it has been generally supposed that nature does not give the minor scale:—but the harmonicks of the D string Violoncello—and this string is taken merely because the harmonic sounds are distinctly heard—or any other string produces the minor as well as the major scale. the diatonic tetracord and in Theory or contemplation the other two Tetracords if the false 5th or fa. is made perfect Hyper and Hypo:

Harmonic sounds D string Violoncello.

in Alt.



Diatonic Tetracord produced from the Violoncello D string. (c)

Geometrical proportion.

One the greatest quantity: then $\frac{1}{2}$ $\frac{1}{4}$ &c.

Arithmetical proportion.

One the common difference.

Harmonical proportion consists of the above two.

DIATONIC TETRACORD

produced from F' string—F'a perfect Hyper and Hypo.

The image displays three musical staves, each with a grand staff (treble and bass clefs) and a brace on the left. The first staff is labeled 'Hyper' and 'Hypo' and shows a diatonic tetracord. The second staff is labeled 'Hyper' and 'Hypo' and shows a chromatic tetracord. The third staff is labeled 'Hyper' and 'Hypo' and shows an enharmonic tetracord, with the text 'Enharmonic Tetracord or 32 Spiss sounds for the temper.' written below the staff.

These tetracords are frequently written in a kind of short hand thus

The image shows three short-hand notations for tetracords, each on a single staff with a bass clef. The first is labeled 'Diatonic.', the second 'Chromatic.', and the third 'Enharmonic.'.

for it is a long operation to write them out at length and to shew from whence these sounds derive, but which is done farther on.

THE POWER OF THE FA

or note above F la.

B \flat . F \sharp . resolve into C. Harmony — unless this false Fifth is made good upwards by F \sharp . C \sharp . G \sharp . or downwards by B \flat . F \flat . A \flat . — then if the Fifths are tuned perfectly there is quarter tone difference — to speak in round numbers — between G \sharp . and A \flat . in tuning twelve fifths therefore Hyper Hypo there is whole tone difference — to speak in round numbers — or G becomes Enharmonic with A. or in modern language G \sharp . becomes Enharmonic with A \flat . &c. where the Greek scale begins: — thus

G \sharp .	become Enharmonic	A \flat .
D \sharp .	do	F \flat .
A \sharp .	do	B \flat . 12 th fifth. Hyper B \flat .
C \sharp .	do	D \flat .
D \flat .	do	C \flat .
G \flat .	do	F \flat . 12 th fifth. Hypo F \flat .
A \flat .	do	G \flat .




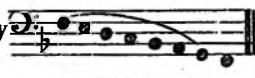

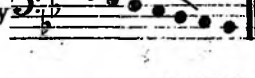

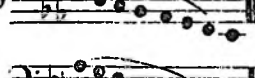


Euclid calls this "Aut communis" and this explains what he means: when he says —

Omnis itaque cantus aut Diatonicus erit: aut Chromaticus: aut Enharmonicus. aut communis. aut ex hisce Mistus. All must therefore be sung either Diatonically: Chromatically: Enharmonically or Commonly or from these tempered together..

Systema or Singing Scale.

Hyper.

Hypo.

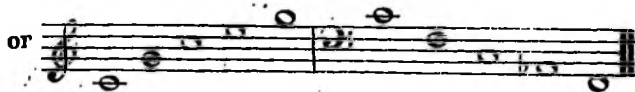
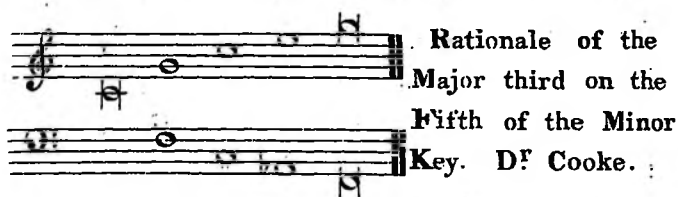
	Diatonically	
	Diatonically	
	Chromatically	
	Chromatically	
	Enharmonically or Harmonia.	

for any seven sounds are a usable scale and may be considered like our Gamut as either Diatonic or Common, or Chromatic, or Enharmonic, or as these tempered together by any bearings.— and may run on in Theory to 13 or 15 modes and then become Enharmonic either half tone higher or lower: or whole tone higher or lower. if the fifths are tuned perfect.— perhaps the following scale of perfect Fifths ascending and descending, or the sounds contained in the Enharmonic Tetracord according to Euclid. will explain this more fully.

The Spiss sounds for the Temper or Mistus contained in the Enharmonic Tetracord are from the B \sharp . and F \sharp . to the pauses at G \sharp and E $\flat\flat$. according to Euclid who says Omnis itaque cantus &c. &c. &c.

It may be observed of this Scale "aut communis" that the A is at the top and the G at the bottom — the reverse of the diatonic tetracord where the A is at the bottom and G at the top: and it is owing to this Idea or Theory of inversion entertained by D^r Pepusch or of tunings Hyper and Hypo ascending and descending that is — that any explanation has ever been given to the diagrams or scales of Alypius: Bacchius &c.&c. or to the Grecian Harmonica.

3^{dly} The Major third on the Fifth or dominant in the Minor Key has always been supposed a thing not to be accounted for. Dr Cooke and to his honor be it spoken says that the fifth is the Tone of communication between the Major and the Minor Key: and that it commands its Major third in both cases—that the Minor Key is the inversion of the Major and that nature insists so strongly on this Major third in the Minor Key: that it cannot be over-ruled:—and that it may be said of this “note sensible.” *Naturam expellas Furca: tamen usque recurrit.*



4thly As the Temper cannot be equal mathematically considered; there is a choice of bearings — Euclid says there are six colours or bearings — his words are. Color generis est divisio specialis sunt vero Rationabiles et noti Colores sex.

Harmoniae unus.

Tres Chromatis.

Diatoni duo.

Colour or bearing is a particular division of the Genera — but there are six known and Rational (i.e. that can be expressed in round numbers without fractions) Colours, bearings or species.

One of the Enharmonic or Harmonia

Three of the Chromatic with

Two of the Diatonic. (d)

Hyper.

Hypo.

Two
Diatonics

Three
Chromatic

Enharmonic
or
Harmonia

The image displays musical notation for various scales. On the left, under 'Hyper.', there are two groups of scales. The first group, labeled 'Two Diatonic', consists of two staves showing a diatonic scale in G major (one sharp). The second group, labeled 'Three Chromatic', consists of three staves showing a chromatic scale in G major. On the right, under 'Hypo.', there are two groups of scales. The first group, labeled 'Two Diatonic', consists of two staves showing a diatonic scale in G minor (two flats). The second group, labeled 'Three Chromatic', consists of three staves showing a chromatic scale in G minor. At the bottom, a single staff is labeled 'Enharmonic or Harmonia' and shows a scale in G major with a key signature of two sharps (F# and C#).

These give the modern temperaments and the modern bearings or colours for the Keys or Harmonies Major and Minor now in use as well as antiently so:— the Sharps and Flats &c. &c. being Tempered or Enharmonic or Harmonia: (e)

TO TUNE A PIANO-FORTE &c.

Pitch

1st Trial.

2^d Trial.

3rd Trial.

Octaves to the top

Octaves to the bottom

The Fifths to be tuned rather Flat: 3^{rds} as Sharp as the ear will permit.

The G# with this Temper serves for the A b. as in the Antient principle five modes. to conclude

The question why Temper?

How account for $b. \#. b.?$

Why seven sounds within the Octave?

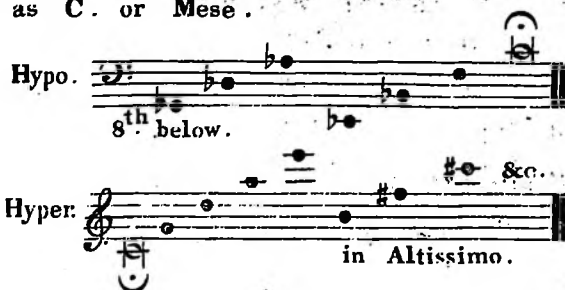
Why twelve sounds within the Octave?

Why infinite $d??$

develope the whole of the Greek Theory and practice as well as the Modern Theory and practice of tuning such instruments as Harps, Lyres, Organs, Harpsichords, and Piano-fortes:—without a temperament or Enharmonic Tuning. The three equivocal chords cannot have a being: These Tunings are called emphatically Harmonia as well as Enharmonia: for Harmony itself cannot exist without them.—The Antients tempered precisely for the same reason that Moderns do: without it sound Generates.—The fifths are deteriorated, spoild, pinched because if all tuned perfect. Sharps and Flats are different sounds — All the Octaves out of tune and the whole becomes a Chaos of irresolvable Discord: according to D^r Pepusch and his Pupils, D^r Cooke, M^r Keeble. — according to Pythagoras: Aristoxenus: Euclid:

Nicomachus · Alypius: Gaudentius: Bacchius & Aristides Quintilianus: and it may be added according to Nature itself (f)

In Theory there may be on the Harmonic D string Violoncello arithmetical proportion D#. A#. E#. and so on ad infinitum: as well as a G#. it is therefore the preponderancy of its Geometrical proportion that reduces this infinitely discordant confusion into one Harmonious sound.— It may be remarked that there is no G \sharp on D string which is wonderful.— but it is the same on wind instruments — one must therefore be tuned — and this is the difference between the Authentic and Plagal — Authentic or upright is the natural harmonic of any string as before shewn the Plagal or Oblique is the fifth above and fifth below any given sound — as C. or Mese.



If these Fifths are all tuned perfect—Sharps are all generated upwards ad infinitum and Flats downwards ad infinitum: or infinite Chromatic. Colour. split is produced. in a fixed scale, therefore like a Harp among the Antients or a Piano-forte with the Moderns—Temper or an Enharmonic tuning is absolutely necessary: among the Antient writers somewhere it has been said that the Deity himself with all his works and wonders is Enharmonic or Harmonia:— it is certain that the same proportions which act upon the Ear in sound, Act upon the Eye with respect to Colours. and light. and may therefore in some degree act on the other senses of taste, smell, feel,— and there are but two senses more goodsense and nonsense.

That the Greeks were a most vain tho' a most polished people must be allow'd but that they were profound Philosophers, Poets, Historians, Orators, Mathematicians, Architects, Sculptors, Painters, and Musicians cannot be denied.

Their Musical Theory is "a proof of the
 latter the multitude of different instruments
 many unknown to the Moderns — the num-
 ber of persons engaged in their Bands.
 vocal and instrumental is another: — 800
 or 1000 Men Women and Children of the
 finest Symetry and Figure uniformly
 cloathed perhaps — assembled in the no-
 blest buildings — adorned with the richest
 Architecture Sculpture and Painting — play-
 ing to. and singing the most sublime
 Hymns or Poetry. and using the finest
 gesture or Dance. in offering up their
 vows to Apollo: Nemesis or some Muse —
 or in Honor of the Deity. in one of
 the most superb Countries in the World.
 must have been to say the least of it
 a most refined. exalted and magnificent
 spectacle — to say more on the subject
 of the Greek Theory of Music. would
 be a waste of time. since it has been
 fully and Mathematically explained many
 years ago. by M^r Keeble in his Theory
 of Harmonicks.

FINIS.

(a)

or $\frac{4^{th}}{5^{th}}$ } Widen the Octaves.

or $\frac{3^{rd}}{6^{th}}$ } Lessen the Octaves.

or $\frac{7^{th}}{2^{nd}}$ } Half tone. } a Piano-forte, Harp, &c.
Whole tone. } cannot be tuned by the
Gamut.

The rule therefore is to flatten the 5^{th} s
a little. and as every body knows to sharpen
 3^{ds} a little.

(b) Horace Carmen. V. 9.

Sonate mixtum Tibūs. Carmen Lyra.

Hac Dorium. illis Barbarum.

This is the case in modern Music—Pi-
ano-fortes are Tempered—but Horns, Trum-
pets, Violins, Violoncellos &c are not. All
wind instruments are naturally Barbs untem-
pered or non mistum.

The Antients employed many means to tem-
per them—bored holes—used wax &c. &c. &c.

The Moderns bore holes—use keys—centre hitti
&c. &c. for Flutes, Clarionetts &c. there are at
present 24 different Flutes in use. Publii Te-
rentii Comœdiæ — 140 before J.C. Modos Fecit
Flaccus Claudi Tibūs paribus dextris & Sinistris.

Modos fecit Flaccus Claudi Tibūs daubus
dextris.

Modos fecit Flaccus Claudi Acta prima

Tibitis imparibus. deinde duabus dextris &c.
 the Comedies of Terence are headed with
 little notices of this kind and mean per-
 haps the instrumental accompaniments to
 these plays. were Composed by Flaccus in
 such and such a key or mode (not mere-
 ly for Flutes) but the kind of Flute
 named explained the key or mode and
 sort of Band necessary to be employed—
 First Flute being leader of the Band &
 F or B \flat . Flute or Clarionett decided all
 the rest of the band to be engaged.

(c)  in Altis.

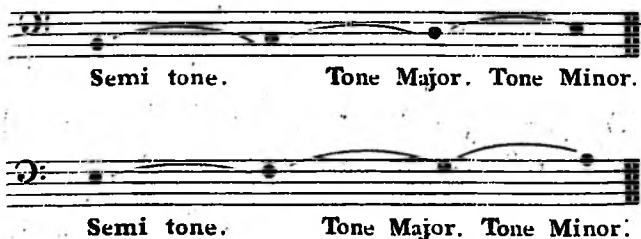
Harmonic D string Violoncello

 # in Altissimo

 in Altissimo.

 in Altis.

Though the G. D. A. &c. may be written as Sharps — Yet in fact they are neither Sharp or the Flat opposite A \flat . E \flat . B \flat . but entirely new natural sounds. and with a little management on the Trumpet or Violoncello &c may be made to pass for either \sharp . \flat . \natural . it shews the inclination to generate or beget new sounds however with their attendant harmonicks Geometrical and Arithmetical, and may like Suns with their planets and satellites extend ad infinitum. — These harmonic Fourths being out of tune points out the Greek Tetracords perhaps — besides that the Tones and half tones divide equally.



The Greeks sometimes call the Fourth a discord and say the fourth and seventh are eternal naturally — this is the case with the seventh in descent and the fourth in ascent — this fourth may therefore be the imperfect tone or semum of the Antients not the semitone. — Violoncello D string G #.

Duetts C. F. Eley.



The 4th and 6th are both bad sounds: on the C♯ string. the A or A♯. passes for B♭. i.e. serves for ♯. ♭. or equivocal.



Harmonic

J. M. Berger

G. string. F. or E♯ serves for F♯. Liepsic.
D. string. B or B♯ for C♯. Etude pour le
A. string. F♯ or Fx for G♯. Violoncelle.

(d) Genus Enharmonium vel simpliciter Harmonia. Ob ejus præstantiam quod solum apte conjunctum & compaginatam conferetur (meib in Euclidis nota 53.) Enharmonium est indivisibile: qui ac singulis est & simplex. (Gaudentius page 4)

Lichani itaque sunt sex.

Una Enharmonios.

{ Aristoxenus p 57

Tres Chromaticæ.

{ 340 before J.C.

Duæ Diatonæ.

sed cum tetrachordorum quos quadrifidos appellamus divisiones innumerabiles sint. sex sunt notæ.

Enharmonii una.. { M. Capella p 187 de
Chromatis tres. { nuptiis Lib: 9. i.e.

Diatonicæ duæ.

The number of Tetrachords without temper may be infinite: but with temper six are known.

Genus est certa quædam Tetracordi divisio — sunt vero Tria modulationis Genera — Harmonia Chroma Diatonum. Enharmonium igitur quia ex minimis diesibus constat est indivisibile.

Quintilianus de Musica

Lib: 1. p. 18.

(e) Euclid tempers these six colours
thus—C. Diatonic Syntone or properly cut.
6. 12. 12.

F^b { Diatonic Molle. } G[#]
4. 4. 22.

B^b { Chromatic Molle. } D^{##}
6. 9. 15.

E^b { Chromatic Sesquialtra } A^{##}
4½. 4½. 21.

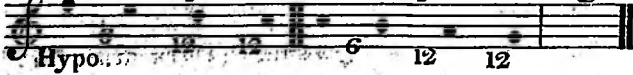
A^b { D^o Tonium. } E^{##}
6. 6. 18.

D^b { Enharmonic or Harmonia } B^{##}
3. 3. 24.

Semi. Tone Tone Semi. Tone Tone
tone. Major. Minor. tone. Major. Minor. proslamb.



Semi. Tone Tone Semi. Tone Tone proslamb.
tone. Major. Minor. tone. Major. Minor.



Words are the perfect diatonic: but Euclid tempers these sounds as marked by the figures: and he calls it Diatonic Syntone or properly cut. i.e. the whole tones are the same size and the half tones exactly so.

Chromatic Tonæum is precisely the same half tones exactly. 6. 6. 18.

Diatonic Molle 4. 4. 22. or half tones closer or less — F. flattened A the third is larger or sharpened or B \flat . F \sharp . flattened.

Chromatic Molle 6. 9. 15. half tone and wide half tone.

Chromatic Sesquialtra $4\frac{1}{2}$. $4\frac{1}{2}$. 21. or the half tones flattened. but the Enharmonic or Harmonia as he calls it: is the most curious for he divides it 3. 3. 24. so that the Flat quarter tones and the Sharp quarter tones change places sometimes in becoming half tones or mistum. and the naturals serve for double Flats and double Sharps or in Modern language the five Flats and the five Sharps become Enharmonic and the \sharp serve for \times & $\flat\flat$ — the whole is Enharmonic, or if you will Harmonia.

The colours or bearings therefore in the Diatonic Syntone: Tonæum: & Enharmonic are those which are called in Modern language the equal Temperament. — and those of the Diatonic Molle: Chromatic Molle: and the Chromatic Sesquialtra: the Thirds are sharpened a little and the Fifths flattened a little and both these temperaments are still in use & are the common tunings of Piano, fortes &c.

These tunings of Euclid have the same defect, - if it is one, that the modern tunings have. he says that there are 6 colours known and rational i.e. that can be divided in round numbers without a fraction: but this fraction, or Angle, or Point, or Comma in Theory is infinite - Eternal - is the cause of the generation of sound: and is one display out of millions of that wisdom and omnipotence inscrutable that created all things - in fact there is a natural defect that can never be done away with, but this defect miraculous to say is of infinite use and beauty - for sound itself cannot exist without these Chromatic splits or fractions - one sound consists of infinite sounds, and infinite sounds produce one sound. *Rerum Concordia discors* - Horace says. Concord is the jarring of all things. there is a natural defect, and tuning perfectly will put all out of tune. for there is a defect in the perfect Diatonic!!!

Six colours or 12 sounds within the octave are quite as many as are practicable - and it is a most puerile idea of perfection to cut the octave into 32 sounds, on the Piano-forte and utterly impracticable in large Bands - for discords as well as concords must have a Basis to support them - and if the Basis gives way, what becomes of the discord or its Resolution? these tunings therefore are most properly called Harmonia as well as Enharmonia.

Lower half of the string	f#.	F#agiolet upper half of the string.	
or Flagiolet, or Harmonic	e.		
sounds produced in these	d.		
places if not press'd down.	c.		
viz.	b.		
	e.		
C.2... (8 th)	Semitone	C $\frac{15}{16}$	Sounds produced if pressed down B. is obtained as the 5 th above F., or 3 ^d above G.
F.5... (3 ^d)	Tone Major	B $\frac{8}{9}$	
	Tone Minor	A $\frac{9}{10}$	
G.3... (5 th)	Tone Major	G $\frac{8}{9}$	
C.4... (8 th)	Semitone	F $\frac{15}{16}$	
F.5... (3 ^d)	Tone Minor	E $\frac{9}{10}$	
C.8... (8 th)	Tone Major	D $\frac{8}{9}$	

It will be seen by the foregoing scale that the Tones are of different sizes and that the half tones are too large—that the Fifths C. G.—G. D. contain two Major Tones, one Minor Tone, and a Semitone: but that D. A. contains two Minor tones and one Major tone and a Semitone: it is therefore a Comma (or tenth part of a diesis) less than the other two Fifths: though this is inaudible in tuning 7 sounds yet if all the Fifths are tuned perfect every third fifth being a Comma too much will enlarge the Octaves and put the whole out of tune. It will be found in tuning 12 fifths from F^q. ascending that the E. (or in Modern language E[#]) will become nearly F^q. instead of being half tone from F^q. and in descending the same thing will happen from B^q. so that the octave is widened by the perfect fifth tuning or A^b. lower than G[#]. but three Major thirds will not fill up the octave. for A^b. will be higher than G[#]. hence the necessity of pinching Fifths and widening Thirds.